12 – Rock Check Dams

Definition

Small temporary stone dams constructed across a swale or drainage ditch.

Purpose

To reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch. This practice also traps sediment generated from adjacent areas or from the ditch itself, primarily by ponding of the stormwater runoff. Field experience has shown it to perform more effectively than silt fence or straw bales in the effort to stabilize "wet-weather" ditches.

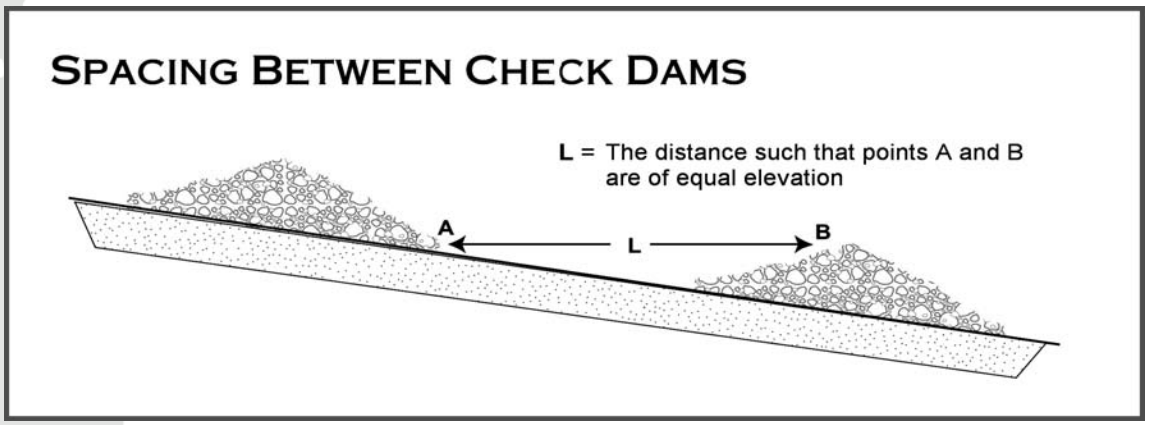
Conditions Where Practice Applies

- Alongside haul roads and other areas where ditches are the method of drainage, and in the bottom of hollows or swales where skidding has occurred (skidding is not recommended in these areas) and a temporary solution is needed until permanent vegetation can be established. This practice, using a combination of stone sizes, is limited to use in small open channels that drain 10 acres or less. It should not be used in a live stream as the objective should be to protect the live watercourse.
- Temporary ditches or swales that, because of their short length of service, cannot receive a non-erodible lining but still need protection to reduce erosion.
- Permanent ditches or swales that, for some reason, cannot receive a permanent non-erodible lining for an extended period of time.
- Either temporary or permanent ditches or swales that need protection during the establishment of vegetation.
- An aid in sediment trapping strategy for silvicultural operations.

Planning Considerations

Check dams are effective in reducing flow velocity and thereby the potential for channel erosion. It is preferable to establish a protective vegetative cover lining or to install a structural channel lining than to install check dams in log haul road ditches, swales, etc. However, under circumstances where this not feasible, checks dams are useful.

As previously mentioned, rock dams have been found to be an effective aid in trapping sediment particles by virtue of the ability to pond runoff. Other measures may be required in addition to rock dams to more completely filter sediment in ditches and swales.

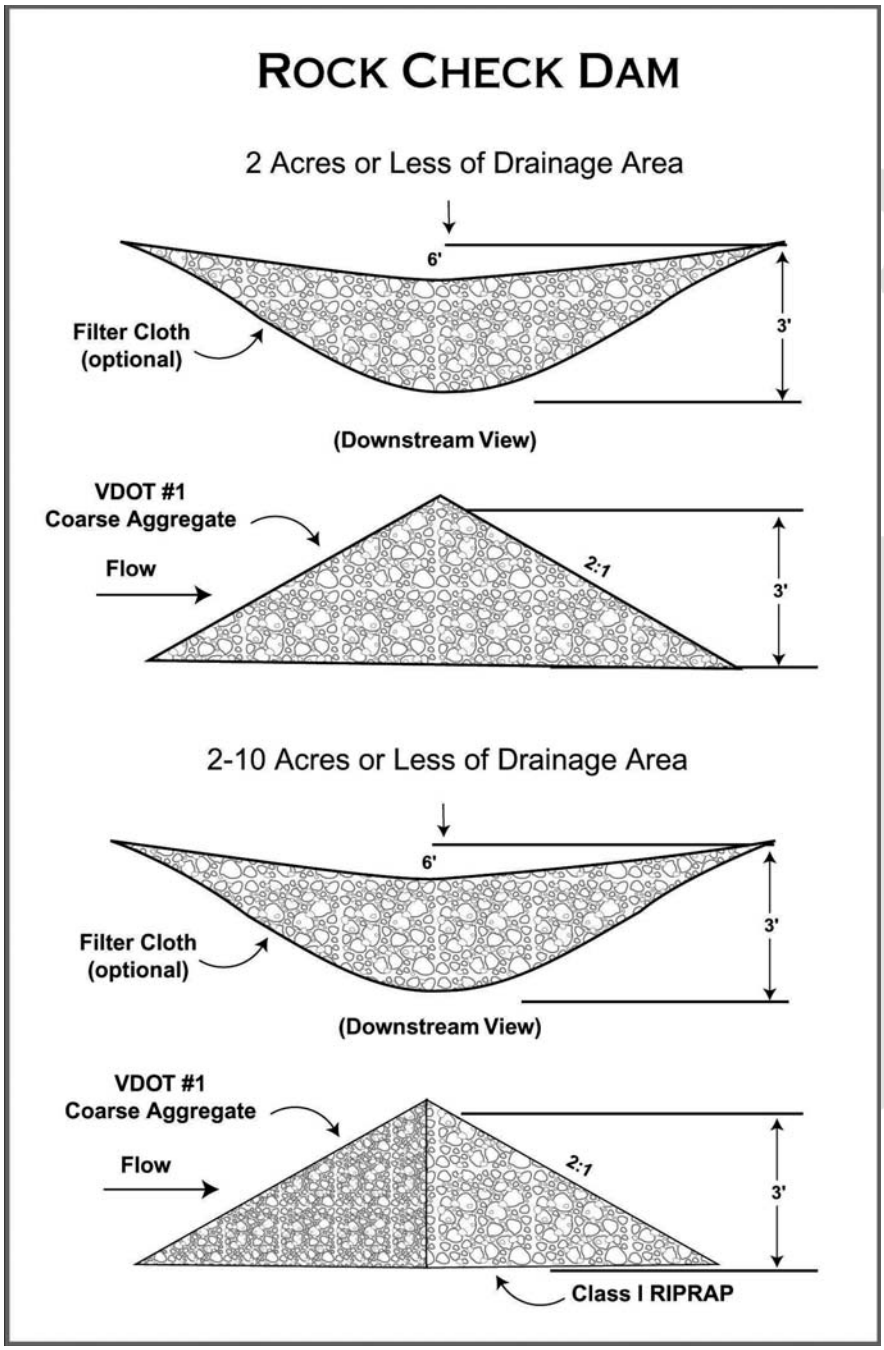


Recommended Specifications

- The drainage area of the ditch or swale being protected should not exceed 2 acres when VDOT #1 Coarse Aggregate is used alone and should not exceed 10 acres when a combination of Class I Rip-rap (added for stability) and VDOT #1 Coarse Aggregate is used. An effort should be made to extend the stone to the top of channels banks.
- The maximum height of the dam should not exceed 3 feet.
- The center of the dam should be at least 6 inches lower than the outer edges to promote a "weir" effect. If not constructed in such a manner, stormwater flows are then forced to the stone-soil interface, thereby promoting scour at that point and subsequent failure of the structure to perform its intended function.
- For added stability, the base of the check dam should be keyed into the soil approximately 6 inches.
- The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- Hand or mechanical placement will be necessary to achieve complete coverage of the ditch or swale and to insure that the center of the dam is lower than the edges.
- Filter cloth may be placed under the stone to provide a stable foundation and to facilitate the removal of the stone.

Maintenance

Check dams should be inspected for sediment accumulation after each runoff-producing storm event. Sediment should be removed from behind the check dams when it has accumulated to one-half of the original height of the dam.



13 – Mulching

Definition

Application of plant residues or other suitable materials to the soil surface.

Purpose

To prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.

To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.

Conditions Where Practice Applies

- Areas that have been permanently seeded may require mulching to enhance seedling germination.
- Areas that cannot be seeded because of the season may be mulched to provide some protection to the soil surface. An organic mulch should be used and the areas then seeded as soon as weather or seasonal conditions permit. In most cases the area should be seeded immediately so that if desirable seasonal conditions occur, vegetation is established at the earliest date.
- Mulching may be used in conjunction with temporary seeding operations.

Planning Considerations

Mulches are applied to the soil surface to conserve a desirable soil property or to promote plant growth. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed land.

Mulches can increase the infiltration rate of the soil, reduce soil moisture loss by evaporation, prevent crusting and sealing of the soil surface, modify soil temperatures, and provide a suitable microclimate for seed germination.

Organic mulch materials, such as straw, wood chips, bark, and fiber mulch have been found to be the most effective.

Chemical soil stabilizers or soil binders should not be used alone for mulch. These materials are useful to bind organic mulches together to prevent displacement.

A variety of manufactured soil stabilization blankets and matting have been developed for erosion control. Some of these products can be used as mulches, particularly in critical areas such as waterways. They may also be used to hold other mulches to the soil surface.

The choice of materials for mulching will be based on the type of soil to be protected, site conditions, the season, and economics. It is especially important to mulch liberally in mid-summer and prior to winter, and on cut slopes and southern slope exposures.

Organic Mulches

Straw – The mulch most commonly used in conjunction with seeding. The straw may come from wheat, oats, barley, etc., and may be spread by hand or machine. Straw can be windblown and should be anchored down by lightly scattering brush over the straw, or by other acceptable methods.

Hay – May be used in lieu of straw and may be spread by hand or machine. Hay can be windblown and may need anchoring or tacking down.

Corn Stalks – These should be shredded into 4-6 inch lengths. Stalks decompose slowly and are resistant to displacement.

Wood Chips, Bark Chips, Shredded Bark chipping trash – Decompose slowly and do not require anchoring. Chips must be treated with 12 pounds of nitrogen per ton to prevent nutrient deficiency in plants and should not be used on stream banks where there is a chance woody debris and logging slash can enter the stream channel during storm events. Logging slash is better used as filters at outlets of drainage structures, brush barriers, etc. Green wood chips, bark, logging slash, etc., can be used in combination with straw or hay mulches, but used alone it is not the best mulch to promote perennial vegetation.

Fiber Mulch – Used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over (as a separate operation) newly seeded areas. This form of mulch does not provide sufficient protection to highly erodible soils. Fiber mulch is not considered adequate mulch when used during the dry summer months or when used for late fall mulch cover. Use straw or old hay mulch during these periods. Fiber mulch may be used to tack (anchor) straw or hay mulch. This treatment is well suited for steep slopes, critical areas, and areas susceptible to displacement.

Chemical Mulches and Soil Binders

A wide range of synthetic, spray-on materials are marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, rubber or other substances that are mixed with water and applied to the soil. They may be used alone in some cases as a temporary stabilizer, or in conjunction with fiber mulches or straw.

When used alone, chemical mulches do not have the ability of organic mulches to insulate the soil or retain soil moisture. This soil protection is also easily damaged by traffic. Application of these mulches is usually more expensive than organic mulching and the mulches decompose in 60-90 days. A composted or air-dried organic mulch is preferred when available.

Blankets and Matting

Field experience has shown that plastic netting, when used alone, does not retain soil moisture or modify soil temperature. In some cases it may stabilize the soil surface while grasses are being established, but is primarily used in waterways and on slopes to hold straw, hay or similar mulch in place.

Jute mesh and other soil stabilization blankets are good choices for mulching on difficult slopes and in minor drainage swales. Many of the soil stabilization matting (used to create a permanent matrix for root growth within the soil) must receive mulching in order to properly stabilize an area. Notably, permanent matting is available that includes self-contained, temporary mulching materials; however, these measures should meet the recommendations noted in "Soil Stabilization Blankets and Matting," Specification 14, before being used on steep slopes and in channel flow situations.

The most critical aspect of installing blankets and mats is to obtain firm, continuous contact between the material and the soil. Without such contact, the material may fail and thereby allow erosion to occur. It is important to use an adequate number of staples and make sure the material is installed properly in order to maximize soil protection. These are discussed in more detail in Specification 14.

Recommended Specifications

Organic mulches may be used in any area where mulch is required.

Materials – Select mulch material based on site requirements, availability of materials, and availability of labor and equipment. Other materials such as peanut hulls and cotton burs may be used as a mulch. Many of the organic mulches may require the addition of Nitrogen (N) to replace Nitrogen removed from soils in the process of decomposition of the mulch, which is in addition to soil requirements before mulch is added. Mulches such as bark mulch may deter germination and growth of vegetation, which in extreme cases may require the removal of bark mulch to be replaced by a more compatible mulch.

Prior to Mulching – Complete required grading and install temporary erosion control structures and other BMPs as needed.

Lime and fertilizer should be incorporated and surface roughening accomplished as needed. Seed should be applied prior to mulching except in the following cases:

- Where seed is to be applied as part of a hydroseeder slurry containing fiber mulch.
- Where seed is to be applied following a straw mulch spread during winter months.

Application – Mulch materials should be spread uniformly, by hand or machine.

When spreading straw or hay mulch by hand, divide the area to be mulched into approximately 1,000 sq. ft. sections and place 100 to 200 lbs. (2 to 4 bales) of straw or hay in each section to facilitate uniform distribution.

Mulch Anchoring – Straw and hay mulch may need anchoring immediately after spreading to prevent displacement. Hay is less likely to be displaced than straw. The following methods of anchoring straw or hay may be used:

1. *Brush* – Cut brush, and in some cases hay mulch, may be scattered thinly over straw to prevent displacement. The brush should be single branched (butt of branch no larger than 1.5 inches) and only enough applied to hold mulch in place.

2. *Mulch anchoring tool* (often referred to as a Krimper or Krimper tool) – This is a tractor-drawn implement designed to punch mulch into the soil surface. This method provides good erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery should be operated on the contour.

3. *Fiber Mulch* – A very common practice with widespread use. Apply fiber mulch by means of a hydroseeder at a rate of 500-750 lbs/acre on top of straw mulch or hay. It has an added benefit of providing additional mulch to the newly seeded area.

4. *Liquid mulch binders* – Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks to prevent displacement. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil. There are several suitable binders available. Seek recommendations from a Forest Engineer.

5. *Mulch netting* – Lightweight plastic, cotton, or paper nets may be stapled over the mulch according to manufacture's recommendations.

6. *Peg and twine* – Because it is labor-intensive, this method is feasible only in small areas where other methods cannot be used. Drive 8-10" wooden pegs to within 3 inches of the soil surface, every 4 feet in all directions. Stakes may be driven before or after straw is spread. Secure mulch by stretching twine between pegs in a criss-cross within a square pattern. Turn twine 2 or more times around each peg.

Maintenance

All mulches and soil coverings should be inspected periodically (particularly after rainstorms) to check for erosion. Where erosion is observed in mulched areas, additional mulch should be applied. Nets and mats should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re-install netting or matting as necessary after repairing damage to the slope or ditch. Inspections should take place up until vegetation is firmly established.

14 – Soil Stabilization Blankets and Matting

Definition

The installation of a protective covering (blanket) or a soil stabilization mat on a prepared planting area of a steep slope or channel.

Purpose

To aid in controlling erosion on critical areas by providing a microclimate that protects young vegetation and promotes its establishment. Some types of soil stabilization mats are also used to raise the maximum permissible velocity of vegetated channels by reinforcing the vegetated channel to resist the forces of erosion during storm events.

Conditions Where Practice Applies

- On short, steep slopes such as cut and fill slopes, and in side ditches on haul roads and skid trails, where erosion hazard is high and planting is likely to be slow in providing adequate protective cover.
- In vegetated channels where the velocity of flow exceeds recommended velocity for other applications.
- On streambanks or other areas where moving water is likely to wash out or destroy germinating and juvenile vegetation.
- In areas where wind may prevent standard mulching practices from remaining in place until vegetation becomes established.

Planning Considerations

Soil stabilization blankets and mats can be applied to problem areas to supplement nature's erosion control system (vegetation) in its initial establishment and in providing a safe and "natural" conveyance for high-velocity stormwater runoff.

Installation Recommendations

Site Preparation - After site has been shaped and graded, prepare a friable seedbed relatively free of clods and rocks more than 1" in diameter and any foreign material that will prevent uniform contact of the protective covering with the soil surface. If necessary, redirect any runoff away from the ditch or slope during installation.

Seeding – Lime, fertilize, and seed as appropriate for site conditions. When using jute mesh on a seeded area, apply approximately one-half the seed after laying the mat.

When open weave nets are used, lime, fertilizer, seed and mulch should be applied before laying the net. When using a combination blanket (such as an excelsior blanket), seed and soil amendments should be applied before the blanket is laid. In some treatments, mulching is applied after installation of treatment, depending on volume and velocity of flow expected in channel treated.

When installing blankets and mats, it is important to follow the manufacturer's recommendations for laying and anchoring, orientation on slope, overlap, etc. A Forest Engineer can assist with recommendations for the proper treatment, application, and installation.

Maintenance

All soil stabilization blankets and matting should be inspected periodically following installation, particularly after rainstorms, to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, re-install the material after repairing damage to the slope or ditch. Continue to monitor these areas until they become permanently stabilized.